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Impact of Small-Scale Mining Activities on the Livelihoods Assets of Rural Households in the Bekwai Municipality, Ghana

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Abstract

The livelihood asset is a primary concern in support of household livelihoods, poverty elimination and enhancing sustainable development, particularly true for mining communities. Underpinned by this, the general objective of the study was to assess the impact of small-scale mining activities on the livelihood assets of households in the Bekwai Municipality, Ghana. The study areas included were mining (Kokotro and Konyaw) and non-mining (Poano and Ntinanko) communities within Bekwai Municipality with 400 household sample size. The Propensity Score Matching (PSM) was used to generate propensity scores to estimate the average mining effect on the household assets. The results revealed that that the household financial assets were positively (3.15) impacted by the activities of Small-Scale Mining (SSM) activities while natural capital was negatively impacted (-4.15) followed by human capital (-3.78) and social capital (-3.25). Virtually, the negatively affected households do nothing (45%) as a coping strategy while others also relied on efforts by District Assembly Taskforce (27). It is recommended that the severe negative impact on the natural assets needs an urgent and strict supervision on mining concession sites and also calls for an alternative source of livelihood activities (cash crops, palm plantation



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and processing) which are prospects for the government's policy of planting for food and agriculture and one district one factory.

Keywords: Sustainable livelihood, livelihood assets, small-scale mining, Bekwai Municipality

1. Introduction

The sustainability of livelihood assets mainly natural, physical, human, social, and financial and capital is a security of rural households against poverty, hunger, unemployment, and sustainable development, especially in mining districts. In this paper, the study introduced the propensity score matching which has been widely used in impact analysis to estimate the average outcome of the impact of small-scale mining (SSM) on the given household livelihood assets within the mining and non-mining communities. The Bekwai Municipal, formerly known as the Amansie East District in the Ashanti Region of Ghana have three geological rock formations which have been identified to have great potentials and rich minerals such as gold, clay, sand and gravel deposits. These geographical features have caught the attention of not only the local residents to engage in small-scale mining activities but also Ghanaians and other foreign nationals such as the Chinese.

Generally, it is indicated that mineral wealth, especially small-scale mining, represents a potential basis for economic growth and sustainable livelihood development, especially, in Africa (Chiomba, 2016). Some studies (ECA, 2011; and Buxton et al., 2013) indicated that small-scale mining activities remain unregulated throughout most African nations, yet it also provides employment for a significant percentage of the populace in these Africa nations. In Ghana, for instance, small-scale mining is a livelihood activity which employs an estimated one million people and supports nearly 4.5 million more (McQuilken & Hilson, 2016). In addition, the governments of mineral rich resources such as Ghana, Burkina Faso, Mali, Malawi, Mozambique, Zambia, and Tanzania, among others do benefit significantly in terms of revenue, export rate, gross domestic product and raw materials exploitation to other sectors of their economy (ECA, 2011).

Unexpectedly, a recent survey by the U. S. Geological Survey in 2017 revealed that the Chinese has doubled its gold mine production and has risen to the top slot, while South Africa fell from first to seventh due to the decline of its production. Russia has climbed to the number three in 2016 while Ghana was ranked eleventh (11th) in gold production failing to be listed among the top ten (10) (U. S. Geological Survey, 2017). Could the successes and detriments of the developed and developing countries among the ranking be attributed to policy environments that ensure sustainable mining?




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Chiomba (2016) in her report posited that most developed countries involved in mineral extraction have optimized an effective and sustainable use of their mineral resources to enhance industrial development. Yet, small-scale mining activities in Ghana has been banned for almost a year now following the government's belief that small-scale mining cannot achieve its purpose of sustainable and economic development if its associated impacts on rural livelihoods are not given consideration. From a development perspective, the household livelihood assets of a given community may increase or decrease (change in quantity and/or quality of livelihood assets) due to factors related or unrelated to mining activities (Isaacs & Gervasio, 2010).

Nearly to three decades now, there have been several studies (Garcia et al., 2015; Mensah et al., 2015; Mihaze, 2013; and Hilson, 2011) on the adverse impact of Small-scale Mining (SSM) activities ranging from poor adherence to policies, regulations and intervention by

SSM which has contributed to severe negative destruction of the environment (water, lands, forests and ecosystems) as well as social impacts (conflicts, crime, health problems, etc.). There have also been an emergence of a demand-driven research into the changing perceptions of governments on the contributions of small-scale mining (Bwesigye, 2018), attitudes of local people to mining policies and interventions (Twerefou et al., 2015), an analysis of risk perception and sustainable mining development (Adeyemi & Olagaju, 2017), perceived environmental impact of SSM activities (Awatey, 2014), and the local perception on the formalization of SSM (Salo et al., 2016). In the midst of these adverse impacts of small-scale mining activities on household livelihoods, the extant of literature limits its scope to only mining communities while this study collaborates the impact of SSM on households' livelihood assets within the mining and non-mining communities. In addition, most of the identified studies are purely qualitative while the purpose of this study sought to introduce a quantitative assessment of the extent of the impact of SSM on the household livelihoods to which crucial sustainability criteria are being met using the livelihood asset indicators: mainly human, natural, physical, social and financial. Uniquely, the study is rare in Ghana and a research gap to be filled in the study area (Bekwai Municipality). It also contributes to the subjects of empirically assessing the coping strategies of households that are negatively affected by small-scale mining activities.

Against this background, the general objective of the study was to assess the impact of small-scale mining activities on livelihood assets of households in Bekwai municipality, Ghana. Specifically, the study sought to:



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1. Examine the impact of small-scale mining activities on the household livelihood assets pentagon of households in the study areas.
2. Examine the coping strategies of households that are negatively affected by SSM activities in the study areas.

2. Operationalization of Concepts

2.1. Conceptualizing Small-scale Mining

What is often perceived as small-scale mining in many developing countries, and for this study Bekwai Municipal of the Ashanti Region, Ghana, aligns with the “informal, unregulated, unlicensed, undercapitalised and underequipped where there may be little or lack of technical and management skills often resulting in natural, social, human and physical costs to mining communities (Lawal, 2002; Styles et al., 2006; Lungu & Shikwe, 2007; Awatey, 2014; and Faircheallaigh et al., 2016).

2.2. History and trend of Approaches to the impact of small-scale mining activities

Respective Governments of Ghana have purported to sanitize the activities of the mining sector, especially, the impact of small-scale mining activities and to ensure national development which is sustainable. The table 1 below summarises the trajectory approaches of dealing with impacts associated with small-scale mining activities.

Table 1: Period approaches for dealing with Small-scale Mining

Periods	Approaches in dealing with the adverse impact of SSM
1970's – 1980's	Definitional and technical issues
1990 's	Sustainable livelihoods towards community development
2000 – 2015	Millennium Development Goal (Goal 7)
2015 – 2030	Sustainable Development Goals (Goal 15)
2017 -	Ban of Small-scale Mining

Source: adapted and modified from MMSD, 2002

2.3. Conceptualizing sustainable livelihood

The basis of livelihood research works has been tied to the published and popularised working paper in the 1990's (Chambers & Conway, 1992). Since then, there have been numerous attempt at employing livelihood in different disciplines and background of researches (e.g. Carney, 1998; Krantz, 2001; Katjiua, Vaughan & Branston, 2003; Murphy & Roe, 2004; Wilder & Walpole,



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2008; Igoe, 2006; Cattermoul, Townsley & Campbell, 2008, Chiomba, 2016 and Danquah et. al., 2017).

Based on the objectives of the study, livelihood refers to household activities, capabilities, and assets that generate resources for a living (Krantz, 2001). A sustainable livelihood is one which adapts and copes with the environment (processes, policies, and vulnerabilities) while maximizing opportunities for transforming natural capital asset accumulation and use into the other forms of the four (4) livelihood capitals (Dejong, 2012).

2.4. Definition of livelihood assets

In this study's context, the five (5) livelihood assets are vital to achieving sustainable development. It connotes how the government uses national assets and resources through policies to enhance livelihoods and on the other side, it reflects on how a given population (for that matter households) uses the various assets at their disposal to achieve a livelihood outcome using a combination of strategies. The assets within the study centered on – natural capital, physical capital, human capital, financial capital, and social capital. The shape of the Pentagon can be used to show schematically, the variations in the household assets status with effect to the impact of SSM activities. Below are some example of the livelihood assets.

Table 2: Livelihood Assets

Livelihood Assets	Some key indicators of the assets
Natural capital	Land, water, forest, etc
Human capital	Labour, education, health, etc.
Social capital	Crime, teenage pregnancy, conflict, etc.
Physical capital	Roads, housing, etc
Financial capital	Income, market, etc

Source: Author's construct

2.5. Coping strategies

Coping strategies are heavily deployed and practiced by households to reduce and escape from livelihood uncertainties, stress, and shocks. They may take the forms of changing consumption patterns like livelihood diversification, petty trading, migration, reducing number and quality of foods or meals, postponing entertainments, etc. Similarly, coping strategies are made to reduce



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the negative impact of an external change (Bhattarai 2005) which may include but not limited to the impact of small-scale mining activities.

2.6. Empirical studies on the impact of small-scale mining activities on communities

In the mining districts of Ghana, small-scale mining (SSM) has the prospects to reduce poverty, provides jobs and income, and serves as a source of raw materials for local industries including the construction and jewelry industries when diversified (Amankwa & Anim-Sackey, 2004; Yakovleva, 2007). Small-scale mining is economical, culturally, socially and spiritually significant due to its role in community development (Offei-Aboagye et al., 2004). Yeboah (2008) argued that miners sometimes enhance development in remote sites by investing in considerable physical and social infrastructure such as roads, schools, hospitals, electricity and water supplies. Similarly, it was indicated that the households in mining communities are found to have a better well-being than those of non-mining communities (Kitula, 2005 and Danquah et. al., 2017).

Nevertheless, the sector is still faced with numerous environmental problems which include destruction of forest cover, destruction of farms, and disturbance of the natural habitats of game species, water pollution, air pollution, noise pollution, erosion, siltation, land degradation, injuries and fatalities, death among others (Offei-Aboagye et al., 2004; Armah & Gyeabour, 2013; Mensah et. al., 2015; Donkor et al., 2006; Hilson, 2001; Hentschel, 2002; UNESCO 2003; Stephens & Ahern, 2001; Akabzaa & Darimani, 2001; Macdonald et. al., 2014; Mensah et. al., 2015; Schueler et al., 2011; and Ntibrey, 2001).

Human capital was susceptible to the effect of the activities of small-scale mining in a study conducted in the Amansie West District (Danquah et. al., 2017). This was explained by the fact that majority (53%) of households were not having access to farm labour due to the high labour cost as a result of the shift in labour from agriculture to the mining sector. According to a research in South Africa by Rejoice Farisisai Chiomba, she argued that schools, clinics, hospitals and dispensaries, and roads in mining communities may be in poor condition or non-existent around the mining areas (Chiomba, 2016). The social impact coupled with small-scale mining included displacement and unemployment, child labour, accidents, and theft (Kitula, 2005). According to Dupuy (2014), the local community residing in the immediate vicinity of the mine bears a significant social as well as environmental cost. This has resulted in promiscuity and conflict among residents in mining communities.

3. Methodology

The study areas for the study were Kokotro and Koniyaw (Mining Communities) as well as Poano and Ntinanko (Non-Mining Communities) at the Bekwai Municipal, Ghana. This is



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because of the shared similar characteristics and area proximity of the Gold deposit communities. Finally, the livelihoods of households that traditionally have claims about the adverse impact of Small-scale Mining was compared concurrently with the livelihoods of “control” households that do not.

3.1. Research design

The study used the cross-sectional research design. The mixed method approach was adopted for this study. This was used in order to draw from the strengths and minimize the weaknesses of the quantitative and qualitative approaches.

3.2. Sample size determination

Using the geometric projection for the rural household population (22,090) in 2010 at a rate of 2.3% as used by the Ghana Statistical Service (GSS), the target population for the study was 31,960 rural households. The study adopted the simplified formula by Yamane (1967:886) which is given by the formula;

$$n = \frac{N}{1+N(e)^2} ; n= 395$$

Where n = the sample size; N = population (31,960); and e (0.05) = level of precision.

* The sample size of 395 respondents was approximated to 400. This was to ensure an equal proportion of 100 respondents from the four (4) selected communities.

3.3. Sampling procedure

For the purpose of this study, the multistage sampling technique was used for the study. This refers to a combination of three-stage sampling stages, namely, stratified sampling (mining and non-mining communities), purposive sampling (four (4) communities) and simple random sampling (respondents of households) representing 1st, 2nd, and 3rd stages respectively.

3.4. Data collection and analysis

Primarily, data was gathered from household heads using a set of close (dichotomous, Likert scale agreement level, multiple choice questions) and open (to get in-depth explanations of responses) ended questionnaire as an instrument. The raw data passed through the process of cross-checking (scrutinizing every questionnaire item), editing (to check inconsistencies and errors), and coding (group responses into a limited number of categories, strings, or themes).

Quantitatively, the edited data was analyzed using the Statistical Package for Social Scientist version 21, STATA 13, and Excel to facilitate the analysis of the data gathered. Qualitatively, the data was transcribed, cross-checked and edited. Afterward, they were organized into themes and



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analyzed. The final output was presented in the forms of texts and direct quotes by respondents under the stated objectives of the study.

3.5. Methods of data analysis

Objective 1: Assessing the impact of SSM activities on household livelihood assets

Unlike the dominant literature on the impact of small-scale mining (SSM) where many studies are interested in describing the impact of using images as an evidenced-based practice from research, this paper introduces the propensity scores method. Under this objective, the Propensity Score Matching (PSM) was used to generate propensity scores of households with similar characteristics which helped to estimate the average mining effect on the household assets between mining and non-mining communities (i.e. the outcome of SSM impact per the 5 asset pentagon). The PSM is widely employed in different disciplines though, it has been overlooked in estimating the average outcome of the impact of SSM. It is selected because it is less susceptible to the violation of model assumption and can easily detect the lack of covariate distribution between two groups and adjust the distribution accordingly. The concept of sub-classification as traditionally proposed by Cochran (1968) is instrumental in using the PSM. He demonstrated that the effectiveness of sub-classification helps in reducing bias in the estimation of treatment effects.

To ascertain the propensity score using the PSM, one needs to: (1) know your treatment dependent variable; (2) you need to also have the outcome variable; (3) determine the set of observed covariates – in this study it refers to the variables that connote shared and similar characteristics of the respondents within mining and non-mining communities available for matching; (4) run a regression to select covariates that are correctly measured, modelled, and highly correlated with the treatment and with the outcome; (5) estimate the propensity scores; (6) check that the propensity score is balanced across the treatment and control group within strata of the propensity score; and (7) finally use standardized differences or graph to examine the distribution.

The table 3 describes the datasets and definitions of variables used to determine the propensity score for assessing the impact of small-scale mining on the household livelihood assets.

Table 3: Description of variables

Variables	Datasets	Description	Unit of measure
Mining	Mining_C	Treatment-dependent	1 if the participant is in treated dataset in mining community, 0 otherwise.
Human capital	Human_Capital	Outcome variable	Impact score for labour, health, education (index 0 to -9)
Natural capital	Natural_Capital	Outcome variable	Impact score for land, water, forest (index 0 to -9)



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Social capital	Social_Capital	Outcome variable	Impact score for crime, teenage pregnancy, conflict (index 0 to -8)
Financial capital	Financial_Capital	Outcome variable	Impact score for income and market (index 0 to 4)
Physical capital	Phys_Cap_RH	Outcome variable	Impact score for road and housing (index 0 to -5)
Age	Age	Covariate	Years of respondents
Sex	Sex	Covariate	0 if Male and 1 if Female
Years of Education	Years_Education	Covariate	Years spent in education
Household Size	HH_Size	Covariate	Number of members in household
Household head	Hse_Head	Covariate	1 if respondent is the household head and 0 otherwise
Native	Native	Covariate	1 if you are a native and 0 otherwise
Married	Miarried_01	Covariate	1 if married and 0 otherwise
Member of household in mining activity	N_of_HH_SSM	Covariate	Number of members of household in small-scale mining

In this particular study, the coefficients of the PSM results for the outcome variables (household assets pentagon) were presented using a radar diagram to help match the isolated effects on the households in mining communities in non-mining communities.

Objective 2: Analyzing the coping strategies of households that are negatively affected by the activities of SSM

Descriptive Statistics was used to analyze the Coping Strategies of households in the mining and non-mining communities. Cross-tabulations was used to present the analysis using frequencies, percentages, and graphs.

4. Results, Findings, and Discussion

Demographically, it was revealed that the number of males dominated (52%) as respondents as compared to the female (48%) while the case was different in Poano (female-53%), a non-mining community. The respondents were mainly household heads (67%) and natives (70%) of the communities. The respondents (56% of them) had the Junior High / Middle-level School while 14% of them had no educational background. The detail is shown in table 4.



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Table 4: Demographic background of the respondents

Variables	Demographic background of respondents				
	Pool	Kokotro	Koniyaw	Poano	Ntinanko
Sex					
Male	208 (52%)	55 (14%)	51 (13%)	47 (11%)	55 (14%)
Female	192 (48%)	45 (11%)	49 (12%)	53 (14%)	45 (11%)
Household Head					
Yes	265 (67%)	65 (16%)	58 (15%)	68 (17%)	74 (19%)
No	135 (33%)	35 (9%)	42 (10%)	32 (8%)	26 (6%)
Level of Education					
JHS/MLS	224 (56%)	61 (16%)	58 (15%)	50 (12%)	55 (13%)
Primary	66 (16%)	16 (4%)	15 (3%)	19 (5%)	16 (4%)
SHS/O'Level	49 (12%)	10 (2%)	10 (2%)	15 (4%)	14 (3%)
None	46 (12%)	9 (2%)	14 (4%)	12 (3%)	11 (3%)
Tertiary	15 (4%)	4 (1%)	3	4 (1%)	4 (1%)
Status in the Community					
Native	281 (70%)	67 (16%)	72 (18%)	74 (19%)	68 (17%)
Settler	119 (30%)	33 (9%)	28 (7%)	26 (6%)	32 (8%)
Total	400	100	100	100	100

Source: Field survey, 2018

From the table 5, the results also show that the average years of the respondents was 43 years while the average period of stay and household sizes were 26 years and approximately 6 persons respectively. These figures were higher than the Bekwai municipality's report (Ghana Statistical Service, 2014) which indicated 4 persons per households. This puts them at the upfront to be well abreast and informed to give insightful revelations so far as the research objectives are a concern.

Table 5: Demographic background of the respondents

Variables	Pool	Kokotro	Koniyaw	Poano	Ntinanko
Household Size					
Mean (SD)	5.79 (2.88)	5.66 (3.14)	6.95 (2.79)	5.43 (2.83)	5.10 (2.41)
Age of Respondent					



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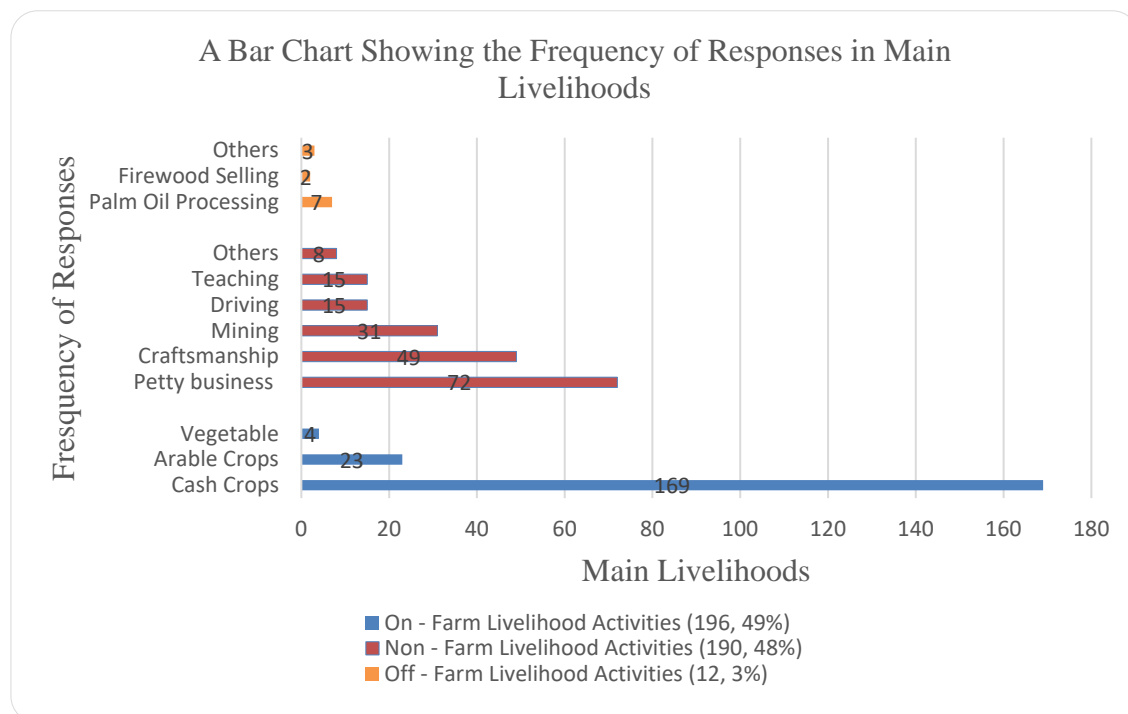
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Mean (SD)	43.44 (13.77)	43.63 (13.37)	42.67 (13.85)	43.73 (15.78)	43.74 (11.99)
Years of Education					
Mean (SD)	7.71 (3.82)	7.92 (3.54)	7.49 (3.88)	7.42 (3.95)	8.01 (8.01)
No of Livelihoods					
Mean (SD)	1.77 (0.61)	1.93 (0.61)	1.77 (0.65)	1.61 (0.57)	1.78 (0.58)
Work Experience					
Mean (SD)	13.68 (9.58)	15.02 (9.85)	11.79 (10.91)	13.25 (11.93)	15.02 (9.85)
Period of Stay					
Mean (SD)	28.24 (17.78)	28.78 (19.45)	30.52 (17.25)	25.13 (18.07)	28.52 (16.02)

Source: Field survey, 2018

The researcher also enquire about the dominant main livelihood activity that the household head or respondent engages in. main income livelihood as used in this refers to the livelihood activity that contributes to more than 70% of the total household income. It was discovered from the figure below that, the Bekwai municipality has a high prospect for on-farm livelihood activities (49%) followed by non-farm activities (48%) and off-farm livelihood activities (3%). The details of main livelihood strategies are presented using the bar chart in figure 7





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Figure 1: Frequency of response on the main livelihood activity of respondents

Objective 1: Assessing the impact of SSM activities on household livelihood assets

The study was to assess the impact of SSM activities on the household livelihood assets within the Bekwai municipality. The livelihood asset pentagon was used as a unit of analysis for the household asset with the five (5) main indicators labeled as human, natural, social, physical and economic capital. However, each main indicator comprised of a different number of sub-indicators.

The Propensity Score Matching (PSM) was used to generate propensity scores to help match similar characteristics of households in mining and non-mining communities. The PSM helped to estimate the average mining effect on the household assets (i.e. the outcome of interest per the 5 asset pentagon). The test of balancing property of the propensity score was satisfied.

From the table 6, the coefficients of the Average Treatment Effect (ATE) show the isolated effect of small-scale mining (SSM) activities on the whole population (mining and non-mining communities), while the Average Treatment Effect on the Treated (ATET) indicates the isolated effect on the subpopulations (mining community alone). The ATE is useful to estimate what is the impact of the outcome of small-scale mining activities if individuals with the same characteristics were randomly assigned to the treatment. However, Heckman in his study indicated that the ATE might not be useful to policymakers because it includes the effect on the control group (Heckman 1997). Therefore, the ATET determines explicitly the effects on the treated group (refers to the impact of SSM on mining communities) who are directly affected to inform policymaker about the way forward.

The empirical results in table 6 are evident just as theory suggests that livelihood assets may either decrease or increase with effect on small-scale mining activities or other exogenous activities. The activities of SSM negatively affects the natural capital (-4.15), followed by human capital (-3.78), social (-3.25) and physical capital (-2.3) while it positively increases the financial capital (3.10). Table 6 shows the summary results of the isolated effect using PSM.

Table 6: Teffects psmatch (Outcome variable) - (Financial Capital); (Physical Capital); (Social Capital); (Natural Capital); (Human Capital)

Teffects psmatch (Treatment Dependent) - (Mining Communities)

Teffects psmatch (Treatment Independent) - (Sex; Age; Years of Education; HH Size; HH in SSM; HH Head; Native; Married)

Treatment effects estimation	Number of Obs	=	400
Estimator: Propensity Score Matching	Matches requested	=	1
Outcome model: Matching	min	=	1
Treatment model: logit	max	=	2



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	Average Treatment Effect (ATE)			ATE & ATET	Average Treatment Effect on Treated (ATET)			ATET / ATE
	Coef.	AI Robust Std. Err.	Z	P> z	Coef.	AI Robust Std. Err.	Z	Ratio (0-1)
Livelihood Assets								
Financial Capital	3.10***	.1658719	18.67	000	2.85***	.1834026	15.54	0.92
Market	2.23***	.1111454	20.06	000	2.14***	.1337979	15.96	0.96
Income	0.87***	.1042302	8.32	000	0.72***	.1255253	5.70	0.83
Natural Capital	-4.15***	.1661469	-24.95	000	-4.00***	.1620608	-24.65	0.96
Water	-1.56***	.0732531	-21.26	000	-1.49***	.0635335	-23.37	0.96
Land	-1.46***	.0729097	-19.96	000	-1.41***	.0673966	-20.85	0.97
Human Capital	-3.78***	.201841	-18.70	000	-3.47***	.1720757	-20.17	0.92
Education	-1.47***	.0730638	-20.15	000	-1.37***	.0683397	-20.05	0.93
Health	-1.39***	.093607	-14.82	000	-1.24***	.0845477	-14.61	0.89
Labour	-.92***	.0846349	-10.81	000	-.87***	.0778571	-11.11	0.95
Social Capital	-3.25***	.1572645	-20.68	000	-3.14***	.0820072	-17.25	0.97
Teen Pregnancy	-1.43***	.0755857	-18.85	000	-1.34***	.0689079	-19.66	0.94
Conflict	-1.41***	.1007377	-14.00	000	-1.41***	.1140683	-13.24	1.00
Crime	-.42***	.0593106	-7.04	000	-.37***	.0552709	-6.69	0.88
Physical Capital	-2.32***	.1208331	-19.18	000	-2.21***	.0983507	-22.42	0.95
Road	-1.24***	.0725124	-17.03	000	-1.17***	.0630144	-18.57	0.94
Housing	-1.08***	.0881675	-12.28	000	-1.04***	.0648005	-15.97	0.96
					Average impact on the ATET			0.94

Source: Field Survey 2018

*** Highly significant at all levels of significance level (.01, .05, and .1) interval scale

Similarly, from the table 6, it was revealed that in terms of the percentage of the average impact, mining communities (ATET) are highly affected representing 94% as compared to the impact on the whole population (ATE). Significantly, the conflict has a ratio 1 (representing 100%) which indicates that the mining community is vulnerable in terms of the occurrence of conflict and leads to insecurity and fear of living or working in a mining community.

The coefficients of the ATE and ATET in table 6 were used as inputs to generate a radar diagram in presenting the effects on the household assets pentagon in figure 6. This was also followed by figure 7 showing the impact of SSM activities on the household assets sub-indicators.



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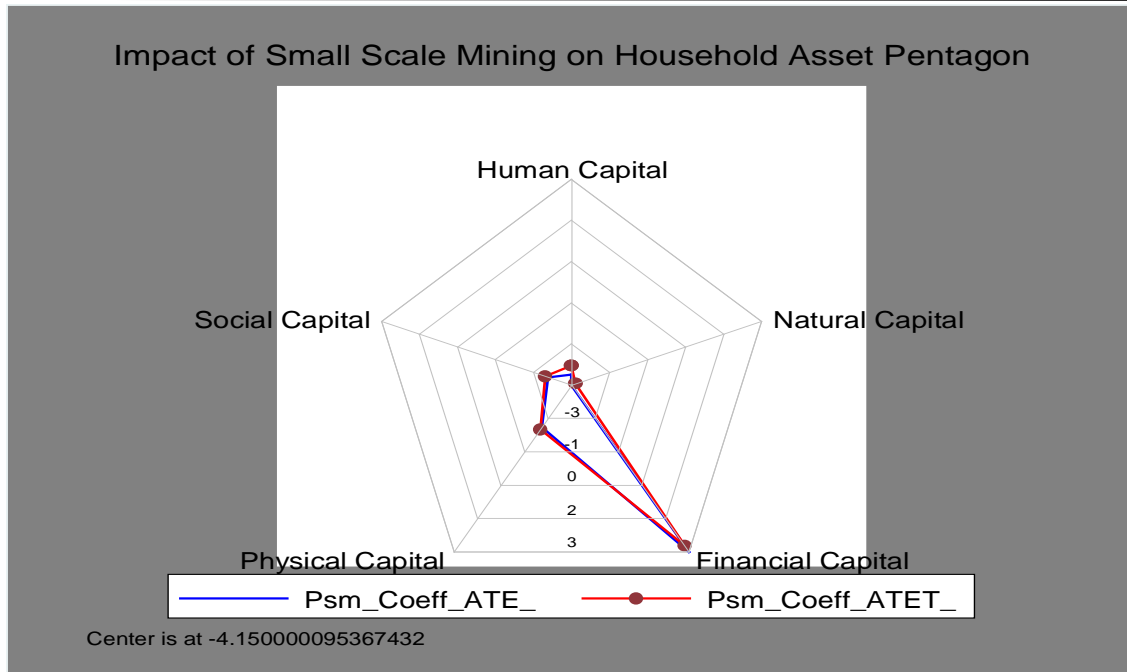


Figure 6: Radar diagram showing the impact of SSM on the main assets pentagon

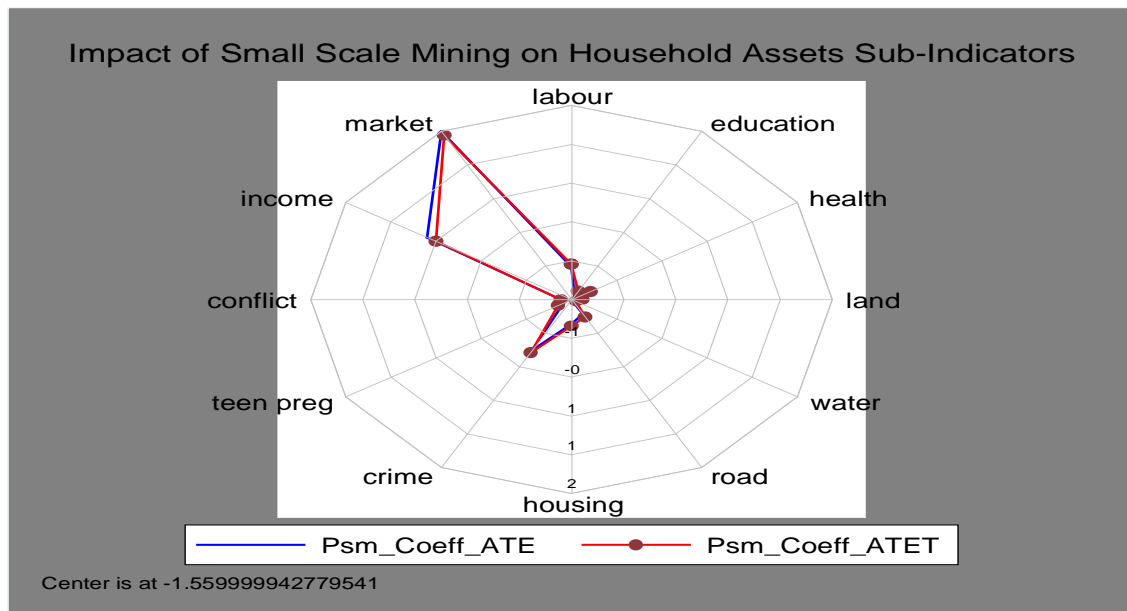


Figure 7: Radar diagram showing the impact of SSM on the household assets components

These results were consistent with that of Kitula (2005), Akabzaa and Darimani (2001), Mihaze (2013), and Twerefou et al., (2015) which revealed that natural environmental problems (land and water pollution), among others, are the major impact of small-scale mining in mining districts.



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Small-scale mining remains a financial giant in mining districts attracting more people into such an economic activity (Mihaye, 2013; Baah-Ennumh, 2017; and Salo et al., 2016).

Objective 2: Analysing the coping strategies of households that are negatively affected by the activities of small-scale mining (SSM)

The study sought further to explore the coping strategies of the households that are negatively affected by the SSM activities within the Bekwai Municipality. From the empirical findings ascertained, it was revealed that more than half of the respondents (58%) admitted that there were some adopting coping strategies while about 42% claim they do nothing. For instance, a male household head respondent among those who reported doing nothing in a mining community explained that:

“My brother, my family can do nothing because the river close to our farm does not belong to me and the capacity to sack these people is not even there. When there is enough rain, we thank God other than that, my small children will carry the water when we are going to the farm from home (borehole)”.

From the figure 5, about 22% also sought refuge from the District Assemblies, Security, and other government institutions capacity to regulate SSM activities, thus, forcing compliance.

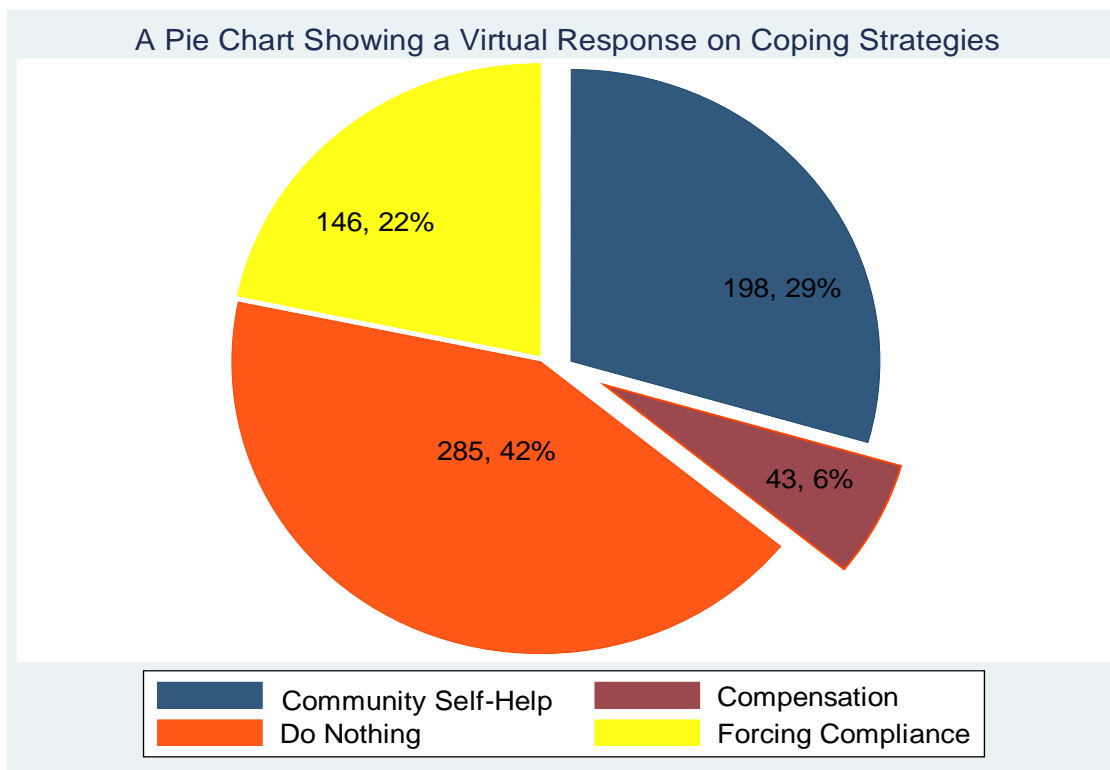


Figure 5: A Pie Chart showing the empirical coping strategies



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Community Self Help (in the form of water and land watch committees as well as individual capacity) was also set up to protect their rivers and lands from miners. For instance, a male household head in Kokotro, a mining community remarked that:

“He has adopted agronomic practices (weedicides and fertilizer) to cope with the labour unavailability and also pay a high cost of labour when harvesting. This has increased my cost of buying more chemical fertilizer as the youth preferred the galamsey job as compared to the GHC. 25.00 per by-day service. Nevertheless, the cocoa output per season (2017) was not able to sustain the family and re-invest in the cocoa farm”.

It is also drawn from the findings that there is a degree of compensation (6% of respondents) for affected farmers and landowners although they complained about the inadequacy of the compensation packages. Detail of the qualitative description was transcribed as presented in the table 7.

Table 7: Coding framework for coping strategies of households that are negatively affected by small-scale mining activities.

Themes	Sub-themes
1. Forcing Compliance	<ul style="list-style-type: none">1.1. Arrest of Minors1.2. Report to District Assemblies1.3. Report on Radio1.4. Rely on Municipal Laws on small-scale mining1.5. Report to the police and/or taskforce
2. Community Self-Help	<ul style="list-style-type: none">2.1. Depend on family labour2.2. Pay high cost for labour2.3. Agronomic practices2.4. Punish school children2.5. Community volunteers on water and forest watch2.6. Fight with miners2.7. Get another land2.8. Communal labour



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3. Compensations	3.1. Support for hospital bills 3.2. Funeral donations 3.3. Compensation on lands taken
4. Do Nothing	4.1. Individuals who explained that they do not employ any adaptive / coping strategies.

Source: Field Survey, 2018

Conclusion

It can be finalized that the study areas in the municipality have a youthful population of household heads as the average age was 43 years. There has been a satisfactory level of education, significantly (88%) of the respondents were literates being able to read and write. These human assets are key prospects to ensure sustainable development. In summary, while SSM activities have a highly significant but negative impact on the natural resource base of mining communities than non-mining communities, it equally has a positive significant financial impact which motivates people to engage themselves in the act. Virtually, the negatively affected households of mining communities do nothing as a coping strategy with little efforts in reporting to District Assemblies and community voluntarism to protect their rivers and lands from miners.

Recommendation

Empirically from the study, the following policy recommendations should help to sustain the household livelihood assets of Bekwai Municipality, Ghana.

1. From the views of the respondents, SSM has a positive impact on the financial assets of households despite the high environmental destruction and reduction in agricultural production, this means that there should be strict supervision and monitoring on concession sites and clear registration of miners (Decentralised Small-scale Mining Stations or Community Environmental Field Protection officers) in mining communities to report to the District.
2. The government can equally create an environment for micro and macro small-scale mining enterprises by providing training, registration, technical and environmentally friendly equipment.
3. There are other vibrant and high-income agricultural activities (cash and arable crops, palm oil processing) in the Municipality which are prospects to be mechanized into the government's policy such as the Planting for Food and Agriculture, One district one Factory and the \$1 million per Constituency initiatives.
4. There can also be an Alternative Livelihood Programme (ALP) to provide a substitute source of employment such as artisanal fishing, soap making and among others. Some



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miners are willing to abandon small-scale mining in favour of other economic opportunities to earn an **acceptable income**.

5. Likewise, other researchers can also explore the economic efficiency of Vegetables, Arable Crops, or palm plantation productivity in the Bekwai Municipality.

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The study was refined under constructive criticism by the Senior Members (Lecturers) at the Department of Agricultural Economics, Agribusiness and Extension, KNUST under the Master of Philosophy Programme in Sustainability Integrated Rural Development in Africa.

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